August 23, 2005 - 1.00 p.m to 1.45 p.m.

Digital Health – Louis J. Burns

Female Voice: -- Digital Health Group, Louis Burns.

[Applause]

Louis Burns: Thank you.

[Applause]

Louis Burns: Good afternoon. It's really a pleasure to be back at IDF after a year hiatus, if you will. As you can see from the video, health care is constantly in the news and constantly on people's minds, and I'm sure each and every one of you has something every week you think about in the health care space.

It's also the subject of a lot of action in governments around the world, and in our government in Washington, there's a lot of work underway. And it really speaks to the seriousness of the issue when you see Senator Clinton and Senator Frist working together on a common bill to try to do something about the health care issues in this country. If you think about that for a second, some people would argue this might be the only issue those two agree on in the 2008 Presidential debates. I know that's a scary thought and I won't tell you which side I'm scared about.

[Laughter]

Louis Burns: Today we're flooded with stories every day about the rising costs of health care and the havoc it brings on families literally around the

world. Every day we hear about patient frustrations with the professionals that are trying to deliver that health care but have the back pressure of spending less and less time every day with their patients. We read about promising drugs but watch loved ones die while it works its way through the regulatory approval process. We blame doctors, hospitals, pharmacies, insurance companies, and of course we always blame the government.

But I really want to tell you the story from a very different perspective. Very different from an area of blaming. In this story, there's really no blame. In every part of the health care system today, there are dedicated, passionate, talented professionals trying to do a good job. And every day they have a system that fails them in little ways each and every day as they try to do that job. Their challenges are truly overwhelming. The pressure is really unbelievable. And any mistake, any wrong decision, can and often times can be catastrophic.

If you think about it, most of the people that work in the system, they work with tools from the early 1990s. Now, can you imagine running your business today with tools from the 1990s? You wouldn't stand for it. But that's what they work with. They want our help, our help as an industry, the technology industry, to bring our innovation and our passion for solving difficult problems to help them in what they're trying to do each and every day. And that's what I want to share with you today for about the next 40 minutes.

Now, this morning, Paul talked and introduced a concept about usage-oriented computing. Our industry will grow when the technology

intersects human needs. Health care is a great example of human needs that can be served by increased use of technology. The health care system needs all of our talents in this room to go after and start solving those problems and move them forward about a decade from where they are today. But to drive change in the system, that must change in order to survive.

If we frame the problem quickly, the data is pretty staggering. Today in the US alone, 15% of the GDP is spent on health care. If you look at other developed countries around the world, it's about 9% of their GDP is spent on health care. And if you look at Greenspan's forecast, which is just staggering, 25% of the GDP could be spent on health care if we don't change how things are being done today. If you think about that, no economy, especially this economy, can afford to spend one in four dollars on health care.

Worldwide health care today accounts for over $6 trillion of spending, and I have news for you: It's going to get a lot worse. If you look at the average age of the people around the planet, what you'll see a phenomenon that we call the bruising of the worldwide economy. This is 2002 data, and it describes a percentage of people around the planet that are 60 years of age or older. Now, if you roll that clock forward 50 years and you look at the average age of the population, what you see here is a dramatic shift. As people age, we also know they consume more and more of the healthcare system. As in other industries, the 80-20 rule is actually a pretty good model here. In the last 20% of a person’s life, they consume about 80% of their medical needs and costs. Today’s system simply cannot scale to deal with this issue.

So, we live in an environment today that's already difficult with a huge wave of aging coming forward into a system that's struggling. If we started today and if we could afford it (which are huge "ifs") and started building hospitals and assisted living centers and nursing homes, and if we started today and educated nurses and doctors and clinicians, we still cannot close the gap to what's coming at us from an aging population and we surely cannot afford it. Our current path leads to failure, yet failure – by definition – is not an option. The system has to change.

Intel started turning its attention to these challenges about two years ago. As you heard from Paul this morning, nine months ago, we had a massive reorganization of the company to focus on platforms. At that stage, I asked Paul if I could run the Digital Health Group for both professional and personal reasons. From a professional point of view, it's a tremendous opportunity for growth in our industry. It's a tremendous opportunity for our industry to apply technology to a very important area – improving global healthcare.

From a personal point of view, I have a 19-year-old special needs daughter. For 19 years, we've experienced the healthcare system in the United States. We've seen the very, very best of that system, and we've seen the very, very worst of that system. Without question, the best is the thousands of people we've worked with in those 19 years that every day try to do something, under the most difficult circumstances, to make a difference. I can tell you firsthand, the very worst of the system is the system itself.

Since taking the job, my team and I have spent nine months listening. We've traveled around the globe and talked to doctors and nurses. We've talked to researchers. We've talked to the leading biomedical companies and the leading pharmaceutical companies. We've spent, literally, hours in hospitals. In one example, in one city we went to a neonatal intensive care unit to just kind of watch and listen to the people that work there and see what we might do as an industry to help them in this very noble task. I saw a 300 gram baby. It had grown in six weeks to 600 grams, which was truly amazing in itself. Sitting beside this kid's little crib – and I do mean little – was 16 inches of documentation, 16 inches of paper in six weeks. We asked the doctors and nurses what they do with it. They said, "We fill it out and put it in that folder." Yet, this same group is trying to correlate the data of what they do in the first six weeks to when that kid is 21 and what happens; did they do something that had an impact?

So, we've talked to and listened to them, and what we've found is a common theme with everyone that we talk to. That common theme was they want us to help. They want us to understand what they're doing; they want us to see if we can apply technologies and industry to help them in what they're trying to do. They need us to listen, and I do mean listen, to really understand. They need us get about solving the problems to enable them to do what they do every day.

To organize our thoughts about this industry, we really came up with a simple concept, which I'll call "shift left." It really is pretty straightforward. What you see on the vertical axis is the quality of life.

On the horizontal axis is the cost of care per day. What I'd like to do is give you two simple examples to illustrate this model.

We've done extensive research with early Alzheimer's patients in very large field studies. What this model talks about is, if through the use of simple sensor networks and simple inference engines, if we can enable a person with Alzheimer's to live at home longer, it's certainly a better quality of life; everybody prefers to be home. Also, if we can keep them from having to move into an assisted living facility, it's certainly cheaper.

Let me give you another example. Say someone has a heart attack. They're taken to the hospital; they try to treat them. They get them settled in. And then they send them home with a regimen of exercise, diet and medication. And what happens in the system today is they trust – they trust that that patient will do what they're told. Now, I have parents that are 88 years old that live on a farm in Michigan. And they're not unlike a lot of people in their generation, is when you take medicine, it's a sign that you're sick. And if you feel better, quit taking the medicine, because you don't want anybody to know you're sick. And that happens over and over around the world.

Through the use of telemedicine, simple devices in the home, we can actually monitor the vital signs in a wireless fashion, monitor the compliance to medication and monitor their exercise, allowing the distance between the doctor and the patient to collapse in such a way that they can do that while they're home, where they prefer, with a better quality of life, at a much lower cost than if they had to do it in

an institution. So if you think about it for a second, the real question we have to solve as an industry is how do we help people shift left with a backdrop of this huge aging population that's coming at us?

The first steps are really about increasing the efficiency for the use of technology, and most importantly, standards. As we look through this, health care really isn't just an industry on itself. It's a very, very complex system made up of hospitals and doctors and nurses and insurance companies and on and on and on. And they all try to work together in some fashion. Because of this, the value in this system is really not created by any one piece of that system. The real value comes from the interactions between all the pieces and how they work and play together, trying to improve somebody's health. If you optimize only one component of the system, you simply move the bottleneck. You move it to someplace else in the system and someone has to deal with it.

Complex systems only change, they only change when the interactions of all the pieces in the system change in a systematic way. Technology is a critical part of enabling that change. You know, what we have today around the world is a massive system which is run on paper with little technology and very little process controls in place. Information does exist, but it exists in isolated islands, fragmented through a complex network of all the different players I've already talked about.

In fact, we were surprised, very surprised, in our first nine months to find that the single largest software expense in health care is proprietary software written to link proprietary applications with

proprietary pieces of equipment. It's the single largest expenditure of software in health care: linking proprietary systems together. If you think about the lack of standardization of interfaces and data has many, many costs. Some estimates suggest that up to a third of that $6 trillion could be saved if we could put standards in place and improve overall efficiency. And there are many people that will actually prescribe to that third number. But that's one aspect.

Patient safety is a much, much bigger concern. Some would argue today there are fewer checks in place in the administration of medication in a hospital than there are in buying a book on Amazon.com today. Think about that. Just think about that for a second. It's an amazing statement. And, by the way, it's very true. The lack of information standardization today, and simple warning flags, causes about two million adverse drug reactions today. A hundred thousand preventable deaths. There's a bunch of estimates here. This is the low end of the estimates. A hundred thousand preventable deaths each and every year. Electronic ordering, we know, can reduce that dramatically. Up to 86% of the errors are reduced through the use of electronic ordering. The data is so clear here, folks; technology does not solve all the problems, by any means, but it certainly takes some very important steps forward to have very important impact.

I'm going to tell you another story. In February of this year we were fighting a rather tough condition with my daughter, and she was under general anesthesia three times in seven days. On the second surgery, she was in post-op. And we were going through all the stuff, and in walked the nice young resident, pediatric resident. And she spent

three, four minutes trying to understand my daughter's 19 years of life. And she was probably in hour 32 of her 36-hour shift, working hard, trying to do the right things. She wrote a prescription for a sedative for my daughter in post-op. She left, and then the post-op nurse, who had been a post-op nurse for 26 years, she pulled it up and she goes, "Jesus, that's wrong." And I said, "What do you mean, it's wrong?" She goes, "It's off by a factor of 10." Now, the good news is the safety system was Nurse Vernon, and it was off by 10x to the low side. If it hadn't been for Nurse Vernon, and it would have been off on the other side, we would have had a very different outcome that day.

We can make a difference here through the use of technology. So what can we do? The key to improving the efficiency is what we already know so well. We understand and we live by standards as an industry. One of the few industries in the world that can compete like maniacs but step back from that playing field every day and agree on standards to improve the overall system. We already know how to do this. Standard technology, standard building blocks and standard data definitions are critical here in improving this system.

The undertaking will be difficult, because there's been many from our industry who have ventured in and quickly out of the health care industry. So our reputation here at times is not very good. So it will be difficult. They want to understand that we're truly going to listen to them. We're really going to understand what their issues are, and then we're going to take our expertise at developing and deploying standards and put it to work in this critical area.

The areas we need to focus on are very, very clear. We need standards for all health care data. We need standards for all health care data. Easy to say, difficult to do, but a very necessary step. We need standards for communications and the interfaces. The good news here is we can use many of the standards that exist today. And we need to deliver on the promise of interoperability, which is critical to improving overall health care.

If you could imagine for just a minute what a system – how the system will change when consumers, you and I, we move from patients to consumers, have their own standardized health care record that is personal, private and portable, which will give you choice. Imagine what will happen when the global – when a global industry consortium puts in place and drives industry standards for all health care equipment, both in the home and in the hospital. Imagine saving a third of the current spend, $2 trillion, through the use of efficiencies gained in the deployment of those standards. These opportunities, folks, are very, very real, and they're sitting right in front of us to go do something about. So it kind of gives you a little bit of a backdrop.

What I'd like to do now is actually spend some time and focus on the hospital. Now, while most hospitals around the world are about a decade behind, remember we talked about 1990s tools, there's been a few that have really shown the courage to step up and drive the use of technology in their hospitals and have gotten excellent results in both patient safety, overall patient care, and costs. And what I'd like to do now is actually show you one of those hospitals.

[Video plays]

Louis Burns: Let's break down what St. Luke's did. We saw as a clear vision, and more importantly, a passion from their CEO to improve health care. And that passion has actually been turned into action. What we saw was a very clear and effective strategy from IT and their CIO to make that passion and that vision come to life. What we saw was outstanding results. What we have now as a hospital where caregivers spend more time with their patients than they spend with their paperwork. And that's why these people got into this industry. They have a passion about helping people, not spending time with paper.

We're seeing similar results in other places around the world. A recent report that you can read here from American Hospital Association suggests that 7% lower mortality rate in those wired hospitals than in others. If you were to translate that across a few thousand hospitals, what it would make the argument for is the potential to save tens of thousands of lives each year as a result. So what I'd like to do now is shift and talk about some of the technologies that are being deployed in enabling this capability.

What we're starting to see happen now is really the evolution of a new set of devices or a new type of devices which are built on industry standards in a form [factor or] implementation focused specifically on the health care space. So what I have here is actually two prototypes. This is a prototype that we've been working with which is based on standard mobile technology, but is designed specifically for clinicians. It has a Bluetooth enabled stethoscope. It has RFID and barcode reader

built into it. It's customizable across the bottom dependent on if the user is a doctor or a nurse, or what kind of rounds you're doing. And there's some early indications that voice over IP out of this will be a big play.

What's important about this is that we've taken this model, and we've talked to lots of doctors and nurses around the world about what this is about. And they've been an active part of defining it. We used to have a rubber hose that went around the neck because it was easy to carry, and they said don't do that. They like some of the things; they dislike some of the others. And what I have, literally off the presses late last night, is this is the next model based on all that feedback, the integration of a lot more capability in a number of spaces. So listening closely, we're defining products based on industry standards to enable them to do their job on a daily basis. So what I'd like to do now is show you another example of how we're using standard technologies today–hi, Jeff, how you doing?

Jeff: Hi. Good. How you doing, Louis?

Louis Burns: He's a brave soul. He's going to be my patient today.

Jeff: [Laughs] Louis promised to be gentle.

Louis Burns: So don't [trust] that. [Laughs] What we have here–and I actually thought I was returning back to my upbringing–this is called a COW.

Jeff: Yep.

Louis Burns: Somebody said "You're going to work with cows," I thought Holsteins, "I'm right back home, I know what I'm doing." It's a computer on wheels. What you'll see here is standard products or devices used in the hospitals today, and then working with Sensotron, the company today, what we've been able to do is link, through standard interfaces of Bluetooth and Wi-Fi, to connect these pieces of equipment as a personal area network and then a local area network. What you'll see up – if you can switch the screens – is on one screen, it will actually be my notebook here, and the other screen, the far screen, is actually the nurse's station where all the information is being collected.

So what we're going to do here is first make sure we've got who our patient is. Kind of makes him feel like a vegetable in a grocery store.

[Laughter]

Jeff: Mango or something.

Louis Burns: I wasn't commenting on your [review], don't worry.

Jeff: [laughs]

Louis Burns: So if you could put your oxygen thing on here for me?

Jeff: Sure.

Louis Burns: Just roll that sleeve up there, big boy.

Jeff: [Laughs]

Louis Burns: I'll warm that bedpan for you later if you [unintelligible] here.

Jeff: Excellent!

[Laughter]

Louis Burns: If not, it's going in the freezer. So let's get started here. So what we'll say is we'll say "Start the chart." And what we'll do is standard piece of equipment, and what we'll actually press here, and it will actually start to process taking his blood pressure and pulse and what-not. Now, why is this important? These are already deployed in hospitals.

There are three really important reasons here. First, it enables the nurses to get through their rounds much quicker, because this is actually collecting data in real time for them and reporting it back into a database, right? And so that's a big deal for them. It improves overall safety, because you don't experience the transcription errors that we currently potentially face today. And then the last part of this, which is really important, is doctors and other people, clinicians, are operating off of really up-to-date or real-time data. Because sometimes, they will have data that's four to five hours old in the decision-making process. So we'll see here it's collected all back. Okay? So we've got to take your temperature.

Jeff: How am I doing, Nurse Louis?

Louis Burns: You're a little warm, big fella. Must be nervous up here. And then what we want to do is take your pain. How's your pain?

Jeff: Now it's about a 6, but now it's about an 8. I'd go all the way to 10, actually.

Louis Burns: Sorry. Shh. Don't tell HR.

Jeff: [Laughs]

Louis Burns: Right. So we've got that data all collected automatically, and it's doing it your local space. What it asks you to do is give some indicators. This actually was breathing room air, if he's still breathing. We'll [fix] that. And then what we want to do is I think we want to send. And what we'll do is actually send that data back to the main database. And it basically, it's collected here and what it says is we've got a problem. No. Everything you did, you must be a runner. You're in great shape. Everything you did is cool. Oh, your blood pressure is up.

Jeff: Well, you know, being knocked around in the head didn't help with that.

Louis Burns: What you see here is that his temperature is up and his pain, self-induced, is actually – excuse me, I induced it – is actually a little high. So I'm way beyond my education here. So what I'd like to do now is, say his doctor's on the road – golfing, at a conference, actually doing some legitimate work –

Jeff: [Laughs]

Louis Burns: Is actually go to his doctor and see what he has to say about this.

Dr. Silverstein: Hi, Louis. First of all, I just received a notification on my cell phone that Jeff has a fever, and one of the things that's very important as a physician is two things: One, the timeliness of data, and secondly, that the data be accurate. What this allows to happen is the reduction in time lag. Many times, a patient will spike a fever, like just happened to Jeff, and it could be two hours until I'm sometimes notified. In the position of Jeff, where he was normal and then spikes a fever, I might only have a window of an hour or two to actually do something about it.

This data is also transmitted to me wherever I am, and the beauty is that it not only gives me the data, but it also gives me the trend lines. I don't have to ask the nurse, "What was his temperature two hours ago? What was it four hours ago?" I can simply look here and I can see that he spiked a fever and in this case, I'm very worried, because he was febrile earlier and he might be septic, so he needs to go back to the hospital. So Louis, the hospital!

Louis Burns: I'll get him there. I'd like to thank Sensotron is the company that's put this together. It's an outstanding example that's adding huge value to the use of standards and deploying those in the medical community. We're very pleased with the work they're doing here, and we'd like to thank them for helping us with this demo. Dr. Silverstien, thank you much. [Applause]. Jeff, thank you.

Jeff: Thanks Louis.

Louis Burns: If you think about it, a wired hospital is an outstanding first step, but we need to go beyond that. What we really need to enable is a wired health care community. Let me tell you what I mean by that. I want every hospital in a city or community connected, interoperable. I want them connected and interoperable with every doctor's office in that same community; with every lab, with every therapist. Because the benefits in a single hospital are obvious; the benefits in a community will have a very, very big positive effect.

In order to do that, we need a technology that would enable it. And of course, we think WiMAX is a great example of that technology. Now to think about what that would mean in a city like San Francisco, a wired community of care, let's take the animation and run it here. And what you'll see here, is I believe we're going to fly in [on Moscone], that's been thing in our demos today, flying you guys around. What you'll see here is we'll fly in on the Moscone Center, and then you'll see the Wi-Fi umbrella here, which is the area you can cover with Wi-Fi, which is a huge advantage in a hospital.

If we start to pull back now, you'll start seeing the hospitals in San Francisco start to pop up. And all these hospitals are within the ring that can be covered by WiMAX. So as we pull away what you'll see is a 50 kilometer reach of all these hospitals, all these doctors offices, all these labs that could be connected together and developed and deploy a community of care for their patients and their overall community. It's a very powerful concept that we have to deliver on, and WiMAX is a great technology that is going to enable us to make that happen.

Now WiMAX is currently being piloted already in hospital systems. If you take a look at one of these pilots in Australia, you can read the quote here from the hospital. They're already starting to see some very big positives with the pilot in delivering a community of care in their community. So huge advantage in that ability. Now some breakthrough thinking has to occur to get hospitals to work together, but that's what we want as consumers of health care.

What I'd like to do now is shift away from the hospital, and talk about the most important element in the community of care, and that's the home. We need to start thinking about our homes as an extension of that community of care. Making the home a site for health care is really critical and necessary in delivering that shift left against the growing population around the planet.

Now we've done a lot of research in this area over the last couple of years, by Eric Dishman and others, in a number of very specific areas of what we could do from a technology point of view. We're now in the phase of translating that research into action and actual prototypes and pilots of products.

We're developing a new class of platforms as we speak. These platforms are focused on 3 very specific areas. We'll call them wellness, okay-ness checking, and telemedicine. Let me tell you what I mean by those. Wellness is really about the concept of a set of validated devices working closely with your PC with online coaching capability to try to make you a healthier person. There are a lot of

pieces out there now, it's really about validating and integrating those and delivering them in an easy to use fashion.

Okay-ness checking is a concept of really helping us take care of our aging parents or relatives. Really not worrying about the distance between us and them. Through the simple use of technology in their homes, we can monitor many things about them to make sure they're okay, right? You don't have to have them move in with you. You can let them stay where they prefer to stay; probably where you prefer them to stay. And let them live healthy independent lives in a very safe fashion.

And then telemedicine, I think, is obvious. Extending the reach of doctors and nurses into peoples' homes. We were talking to UC Davis hospital system. There was a capability -- I didn't even know they'd started, but they reach down into the valley, and they have a neo-natal intensive care capability delivered via telemedicine into some community hospitals in some poorer parts of California. The other unique honor besides telemedicine, they do all the work with the prison system. So, you can debate which one’s good. But, through the use of telemedicine, they’ve been able to extend their reach and deliver care.

What I can tell you is today we’re working with the largest players in the healthcare industry to define, pilot, and deploy these platforms. We’ll be back in the spring to give you a lot more details on each and every one of these platforms.

Now, what I'd like to do is share some new research in the area of Parkinson's patients. To do that, I'd like to introduce Eric Dishman who has been leading the work here in Parkinson's. Hey, Eric.

Eric Dishman: Hey, Louis.

[Applause]

Eric Dishman: Paul talked this morning about coming into the era of usage-centric computing. I got to tell you, you can't get much more usage- or user-centric than going and living with 100 households that are dealing with neurological conditions like Parkinson's and Alzheimer's and stroke. That's exactly what our social science team at Intel did for an entire year before we ever built the first prototype.

I want to show you a picture of Carl, one of the people from that 100-household study. I actually lived with him for a period of time in Rochester, NY. He has Parkinson's disease. His wife will tell you, in some sense he lost himself and he lost his identity when the tremors got so bad that he could no longer use the band saws and other tools in the wood shop in his basement, which is where this picture was taken. But, it actually got much worse for him as he started on Levodopa, which is one of the drugs that they put you on when you start to have Parkinson's. The side effects have, in many ways, taken him away from himself even more where just doing every day functions are more difficult because of the side effects of the drug.

We went with him to his doctor's appointment. He goes about once every nine months or maybe once a year even though he has Parkinson's. He does a 15- to 30-minute exam once a year. He can still drive there; it's kind of frightening to drive there with him, but he can still drive there. [Laughs] And, he does okay while he's there, and this is one of the problems. For that 15 minutes of his exam, he can get through it just fine. But, what's he like the other 364 days of the year?

We've been trying to think about what if we could actually measure the progress of his disease from his own home on an everyday basis? And eventually and even more importantly, what if we could adjust his medications to take them only on the bad days when he really needs them so he doesn't have the side effects for the other six days of the week.

So, what I want to show you right now is a prototype of a device that's just out of manufacturing and running very alpha software. So, we'll hope that the demo gods are with me. This is an in-home detection system that we're working on. This is a collaboration that we're not doing alone but we're doing with an external Parkinson's foundation and with a team of about a dozen world-class neurologists headed by Dr. Christopher Goetz at the University of Chicago and Rush-Presbyterian. Again, you want that clinical and technical expertise coming together to solve real hard problems.

This is an investigatory trial that we're going to start where we'll take this device and test it in 75 households, starting in the fall. This is our "shift left" strategy in action. We're taking measures that have been

done in a clinical setting for years, but actually moving it to the home where you can capture the data on a daily basis. We're actually capturing, in this case, three kinds of data: speech data, tremor data, and data about their movement. Those are three areas where, if you can collect that data, they're the tell-tale signs of Parkinson's to see how the progress for somebody like Carl is doing. We're capturing ten times the data that they capture in the clinic today, down to milliseconds accuracy as opposed to a nurse coming in and watching Carl do this with a stop watch and jotting down a few notes on a piece of paper.

So, I'm going to show you just a couple of the tests here. Somebody like Carl will use this, and he'll come to the at-home testing program.

[Testing program audio]

Eric Dishman: It would actually tell him it's time to take his test. I'm already going to have a bug here. It may not let me do this because it thinks we've already taken the test and done the data. What Carl would actually proceed to do at this point is take these tiny pegs; it's called the Purdue pegboard test. It's been done since the 1950s and 60s. It would instruct him to time how quickly he can move the pegs from the right to the left. Just capturing that kind of data on an everyday basis and looking at his personal trend line could help change the game in not only how we eventually detect the disease, but how we personalize treatment for him.

The second test he might do is actually put on this headset and he would do what's called the "Ah" test. It's kind of embarrassing to do it in front of thousands of people, but basically Carl would do this in the privacy of his own home when his wife wasn't in the same room. The unit would instruct him to say ah into the microphone for as loud and as long as you can. So, he'd go, "Aaaaaaaah." We're measuring two kinds of features here -- what's called fundamental frequency variability, this is the amount of monotone in his voice, and also the amount of energy in his voice. And what we found in our study with Carl is that a lot of people end up discovering that they have Parkinson's because they think their spouse has a hearing problem. And it ends up the spouse has no hearing problem at all, it's that their voice is becoming weaker and weaker and weaker.

And then, finally, Carl would be wearing a watch like this, and when he's done with his test, and he collects a couple of days worth of data, the device would instruct him to place it onto the docking station, and it would also pull over the data of tremor all through his life. Not just for that 15 minutes he's at the doctor's office.

So what could you do if you had a device like this, an open standards based device like this, that these kinds of diagnostics could be layered on top of it. For one thing, we're talking about an entire new field of behavioral markers that help to indicate the onset of disease. And you could eventually embed some of these. In fact, we're already starting to work on this in the lab, where that speech analysis that we're doing, and the tremor analysis, embedded into a cell phone, so he doesn't

have to take the test, he's just using a cell phone in his everyday life, but it's actually looking in an embedded way at how he's doing.

And these capabilities are not just for the millions of people that have Parkinson's, but also Alzheimer's. You could even look at changes in arthritis based on this. And people recovering from stroke. This is an important vision for our industry. It's an important economic opportunity. And it's important because all of us are going to have someone like Carl in our lives.

Now, I want to point out today that we've studied hundreds and hundreds of households and dozens of other diseases of people worldwide. There's a lot more need and opportunity than I can show you in five minutes here today. And I also want to say, these are just baby steps. All right? This is an early device we're going to test in 75 households just to see if we can be clinically accurate or beat what's being measured in a clinic today. But with your intellect, with the imagination that this industry has, with your investment, we can take these kinds of tiny baby steps and turn them into giant steps for humankind. Thanks.

Louis Burns: Thanks, Eric.

[Applause]

Louis Burns: What he just talked about is a concept called behavioral markers. And what I'd like to do now is shift quickly to an area that we call biological markers, or biomarkers. And I'd like to use a video to kind of talk

about what's going on as we take IT working with medical research and trying to advance that entire field.

[Video plays]

Louis Burns: Wow. What you just saw are what I call the rock stars of the medical research field. These are the best and brightest minds focused on a very important and critical task.

What I'd like to share with you now is one of the key partners that we've been working with in medical research and improving that with IT. We've had the pleasure of working with the Fred Hutchison research center in Seattle, which is one of the nation's leading cancer research institutes. To share more about our collaboration I have the immense honor, and I do mean honor, of introducing the president of the Fred Hutchison cancer research center, the 2001 Nobel laureate for his work in medicine, I'd like to welcome Dr. Lee Hartwell to the stage.

[Applause]

Louis Burns: So Lee, why don't you tell us a little bit about the work you guys are doing at the Hutch?

Dr. Lee Hartwell: Well, the Hutchinson center is one of the largest medical research institutions in the country. We have about 3,000 employees working on fundamental biology, clinical research, public health research. Our main goals are in cancer and in AIDS. But the largest problem that we

have, and I think it's true for all of medical research, is to take the fundamental insights that we've gained about biology and convert that into something that's useful in helping patients with their disease.

We've learned an awful lot about cancer, but despite the hundreds of billions of dollars by academia and industry, there really has only been a marginal impact on cancer survival over several years. For example, three decades ago, probably 50% of cancer patients survived their disease. Now that's up to about 60%, which is an advance, but it's small.

Louis Burns: What's really different about your approach versus the last 20 or 30 years in this quest you have?

Dr. Lee Hartwell: Well, let me begin by saying that most of the intellectual effort and resources that are being expended on cancer are focused on discovering drugs to cure late-stage disease. And although there are a few drugs that do extend the lives of some patients, given the enormous investment that's been made in that approach and the relatively small yield, I think we have to say that that approach has largely failed.

People ask if there really is a cure for cancer, and the exciting thing is there is a cure for cancer, and we cure a lot of people frequently, and it depends upon catching that disease at an early stage. If cancer is detected early for almost all cancers then surgery alone and some radiation will usually cure that person. But if cancer is detected late, then people usually die of their disease.

So at the Hutchison Center we're making an investment in trying to detect all cancers early. We're doing this with the help of the National Cancer Institute, who's providing technology support, [reagents], informatic support. And we've assembled a bunch of teams across the world who are each focusing on a single cancer site.

Louis Burns: Can you describe that we've placed in your research center, and how your team is using that, and what's being done with it?

Dr. Lee Hartwell: We believe that the key to detecting cancer early is the ability to discover proteins in our blood that reveal early-stage disease. And the blood is very, very complicated.

There really is only one technology at the present time that is capable of looking at complex protein mixtures, and that's called mass spectrometry. It detects proteins by looking at their mass, and then we look up in the genome to see what protein that might be and identify it. But that technique is incapable of analyzing changes that occur to proteins after they've been made. Things we call post-translational modifications.

So we've been using a sophisticated Ramen spectrometer that was made by Intel and placed at the Hutchinson Center to see if it's possible to detect these modifications to proteins, which are often important clues for disease and physiology. And indeed, we find that we can. And I think this has opened a whole new era in protein analysis.

Louis Burns: So, Lee, the work is truly amazing. But you've got this incredible chance -- we have the computer industry here out in the crowd today. So if you were to talk from your industry, the medical research industry, and you could ask this group, what would be the top two or three things you'd like them to provide for you?

Dr. Lee Hartwell: Well, let me begin by saying that the medical research community is already enormously indebted to and dependent upon the IT industry. Modern biology research generates enormous amounts of data that would be impossible to store and analyze without the advances that have occurred in the IT industry. In fact, most graduate students now spend only about half their time at the bench, and the other half in front of the computer.

But there remain some really big problems that only you can help us solve. First, for example, a lot of really important data is not being systematically collected. I mean like patient data in hospitals. Second, advances are needed in taking very complex data sets and comparing them to extract the information. For example, DNA sequence information from people compared with the diseases that they're susceptible to.

And the third area is that when we make a discovery in a research laboratory that is capable of having a clinical impact, there is an enormous hurdle to getting that out to patients. That involves quality control, standardization, sharing of intellectual property, cost

reduction. Things that your industry has really mastered and we're very far behind it.

Louis Burns: So that kind of gives us our assignment as an industry, what we need to get off and do. If you could roll the clock forward to like 2025, what would you like the world to act like, or how would this change from where it's at today?

Dr. Lee Hartwell: Well, I imagine the health care system in 2020 being a pipeline, where people enter the system, where we actually know their risk of disease before they become ill, and we intervene in disease at an early stage, when it can be cured. And we actually are able to individualize the treatment based upon what that particular person needs as an individual. Unfortunately, at the present time, most people enter that pipeline for health care near the bottom, where really heroic effort is needed to cure acute disease.

Louis Burns: Okay. Thank you so much for coming today and sharing with my industry, and more importantly, thank you for the work you're doing to try to help people in general. Thanks for coming.

Dr. Lee Hartwell: My pleasure.

[Applause]

Louis Burns: I've got the coolest job in the world. I get to hang out with people like Lee. You know, if we were to measure opportunity by the size of the need, then the global health care system offers our industry an immense

opportunity. Health care is a complex system with a decade of catching up to do. If we work closely with and listen closely to the health care professionals, we can and we will make a significant impact. The people in this room, our industry, we contributed to many other industry changes over the last 30 years. The way people consume media, the way people communicate, the way people transact commerce; those are all things that we contributed to. The opportunity now is to do the same thing in health care.

If we simply do what we know how to do already, which is standard building blocks, industry alignment on interoperability, connecting islands of information, those actions alone will have a significant and important improvement.

But this is really much, much bigger than just that. This is really about empowerment of every individual in the health care system. The doctors, the nurses, the patients, the clinicians, the research scientists, it's empowering each and every one of them in their job every day. It's about giving doctors and nurses the right information at the point of decision to make the right call for one of our family. It's about enabling us to remotely care for our elders in a way that's safe for them in a way they would like. It's about enabling people like Lee in medical research on their incredibly important quest with the right information at the right time to hopefully move their discovery forward with a profound, positive impact for people on this planet. And it's about empowering every individual to become an active participant and an informed person in their decision-making in the health care system.

Where technology intersects human need, there is growth. No greater human need currently exists than that of improving global health care. I cannot think of a single challenge quite so worthy of our industry's attention. We can and we will make a difference. Please join us. Thank you.

[Applause]

[Music]

[End of recorded material]